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What is Claimed:

- 1 1. A microcavity-forming system for making microcavities in a wire comprising:
2 a coating station receiving the wire from a source of the wire and applying a
3 polymer coating to the wire;
4 a mask-forming station receiving the polymer-coated wire from the coating station
5 and blowing moist air over the polymer-coated wire to form air bubbles which result in
6 holes in the polymer coating, thereby creating a mask;
7 an etching station receiving the wire, as coated with the polymer mask, from the
8 mask-forming station and etching the wire through the holes in the polymer mask to form
9 microcavities in the wire; and
10 a stripping station receiving the wire from the etching station and removing the
11 polymer mask from the wire, leaving the wire with microcavities.
- 1 2. The system of claim 1 wherein the wire is tungsten.
- 1 3. The system of claim 2 wherein the coating station comprises a tank housing
2 a solution of the polymer in a fast-evaporating solvent.
- 1 4. The system of claim 3 wherein the solution comprises 0.1 to 10 percent by
2 weight of polymer.
- 1 5. The system of claim 3 wherein the polymer is polystyrene and the solvent is
2 selected from the group consisting of benzene, toluene, and carbon disulfide.
- 1 6. The system of claim 5 wherein the solvent is carbon disulfide.
- 1 7. The system of claim 2 wherein the mask-forming station comprises a
2 chamber defining a controlled atmosphere through which the wire travels.

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1 8. The system of claim 7 wherein the atmosphere has a humidity of at least 30
2 percent.

1 9. The system of claim 2 wherein the etching station comprises a container
2 retaining an etching bath.

1 10. The system of claim 9 wherein the etching bath is hydrogen peroxide.

1 11. The system of claim 2 wherein the stripping station comprises an enclosure
2 containing a solvent bath.

1 12. A process of forming microcavities in a wire comprising the steps of:

2 (a) receiving the wire from a source of the wire and applying a polymer coating
3 to the wire;

4 (b) blowing moist air over the polymer-coated wire to form air bubbles which
5 result in holes in the polymer coating, thereby creating a mask;

6 (c) etching the wire through the holes in the polymer mask to form
7 microcavities in the wire; and

8 (d) removing the polymer mask from the wire, leaving the wire with
9 microcavities.

1 13. The process of claim 12 wherein the wire is tungsten.

1 14. The process of claim 13 wherein the polymer is applied as a solution of the
2 polymer in a fast-evaporating solvent.

1 15. The process of claim 14 wherein the solution comprises 0.1 to 10 percent by
2 weight of polymer.

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1 16. The process of claim 15 wherein the polymer is polystyrene and the solvent
2 is selected from the group consisting of benzene, toluene, and carbon disulfide.

1 17. The process of claim 16 wherein the solvent is carbon disulfide.

1 18. The process of claim 12 wherein step (a) includes controlling the thickness
2 of the polymer coating applied to the wire so that the thickness of the polymer coating is
3 about 0.05 to 1 μm when dried.

1 19. The process of claim 12 further comprising the step of controlling the
2 temperature, moisture content, and speed of the moist air blown over the polymer-coated
3 wire.

1 20. The process of claim 19 wherein the speed of the moist air blown over the
2 polymer-coated wire is between 30 and 300 meters per minute.

1 21. The process of claim 12 wherein step (b) is performed while drawing the
2 wire through a controlled atmosphere.

1 22. The process of claim 21 wherein the atmosphere has a humidity of at least
2 30 percent.

1 23. The process of claim 13 wherein step (c) includes passing the polymer-
2 coated wire through a hydrogen peroxide etching bath.

1 24. The process of claim 12 wherein, before step (c), the process includes a
2 preliminary etch of the polymer mask to assure that the holes created by the air bubbles
3 extend completely through the polymer mask.

1 25. The process of claim 12 wherein step (b) includes evacuating the air bubbles
2 from the holes.

1 26. A process of making an etching mask having arrays of holes and conforming
2 to substantially any surface, including an arbitrary curved surface, the process comprising:

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- 3 (a) providing the surface to be etched;
- 4 (b) applying a polymer coating to the surface; and
- 5 (c) blowing moist air over the polymer-coated surface to form air bubbles which
6 result in holes in the polymer coating, thereby creating a mask.

1 27. The process of claim 26 wherein the holes are sub-micrometer-to-
2 micrometer sized.

1 28. The process of claim 26 wherein the polymer is applied as a solution of the
2 polymer in a fast-evaporating solvent.

1 29. The process of claim 28 wherein the solution comprises 0.1 to 10 percent by
2 weight of polymer.

1 30. The process of claim 28 wherein the polymer is polystyrene and the solvent
2 is selected from the group consisting of benzene, toluene, and carbon disulfide.

1 31. The process of claim 26 wherein step (b) includes controlling the thickness
2 of the polymer coating applied to the surface so that the thickness of the polymer coating
3 is about 0.05 to 1 μm when dried.

1 32. The process of claim 26 further comprising the step of controlling the
2 temperature, moisture content, and speed of the moist air blown over the polymer-coated
3 surface.

1 33. The process of claim 26 wherein the speed of the moist air blown over the
2 polymer-coated surface is between 30 and 300 meters per minute.

1 34. The process of claim 26 wherein step (c) is performed while controlling the
2 atmosphere surrounding the surface and into which the moist air is blown.

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1 35. The process of claim 34 wherein the atmosphere has a humidity of at least
2 30 percent.

1 36. The process of claim 26 further comprising the step of etching the polymer
2 mask to assure that the holes created by the air bubbles extend completely through the
3 polymer mask.

1 37. The process of claim 26 wherein step (c) includes evacuating the air bubbles
2 from the holes.